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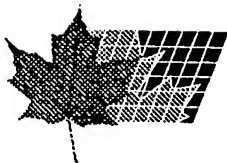
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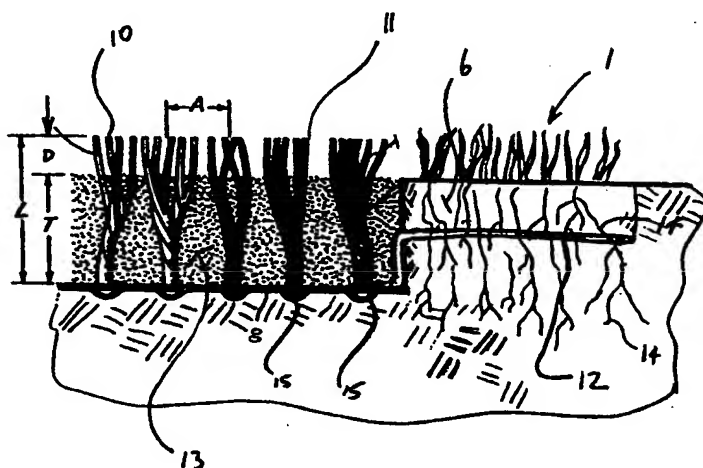
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(54) **SYSTEME DE MARQUAGE POUR TERRAIN DE JEU**

(54) **LINE SYSTEM FOR PLAYING FIELD**



(57) The invention relates to a novel method of visually marking a line in a natural grass turf playing surface by embedding a synthetic grass strip within the turf of football, or soccer fields for example. The synthetic strip has a middle band of light coloured synthetic grass to mark the line and outer bands of green coloured synthetic grass which blends in with the adjacent natural grass. Installation commences with cutting a shallow trench in the turf surface with a sod cutter for example. The synthetic grass turf marking strip is laid into the trench. The strip includes an elongate flexible sheet backing, an underside of which is placed on the trench bottom. Tufted through the backing are parallel rows of synthetic ribbons, extending upwardly from the top surface of the backing a pile height sufficient to extend a selected distance above the trench. The rows of ribbons include a middle band of ribbons of a light colour to mark the line and a pair of outer bands of ribbons of a green colour laterally adjacent the middle band. The strip is then buried in the trench under granular ballast material deposited on the backing and between the parallel rows of synthetic ribbons with an upper portion of the ribbons extending beyond the ballast, in a manner similar to artificial turf. The turf marking strip may be further embedded and secured within the natural turf with a pair of elongate flexible turf anchoring strips laterally outward of the outer bands of ribbons and secured to the backing by sewing or with adhesives. The anchoring strips are of an open weave fabric to allow the roots of the natural turf to grow into and entangle with the anchoring strips. The natural grass lateral band adjacent the green synthetic ribbons gradually grows into and blends with the outer edges of the outer synthetic green ribbon bands. The light coloured middle band of synthetic ribbons remains clear of natural grass to visually mark playing field lines in a permanent manner which requires significantly less maintenance than conventional line marking systems.



ABSTRACT

The invention relates to a novel method of visually marking a line in a natural grass turf playing surface by embedding a synthetic grass strip within the turf of football, or soccer fields for example. The synthetic strip has a middle band of light coloured synthetic grass to mark the line and outer bands of green coloured synthetic grass which blends in with the adjacent natural grass. Installation commences with cutting a shallow trench in the turf surface with a sod cutter for example. The synthetic grass turf marking strip is laid into the trench. The strip includes an elongate flexible sheet backing, an underside of which is placed on the trench bottom. Tufted through the backing are parallel rows of synthetic ribbons, extending upwardly from the top surface of the backing a pile height sufficient to extend a selected distance above the trench. The rows of ribbons include a middle band of ribbons of a light colour to mark the line and a pair of outer bands of ribbons of a green colour laterally adjacent the middle band. The strip is then buried in the trench under granular ballast material deposited on the backing and between the parallel rows of synthetic ribbons with an upper portion of the ribbons extending beyond the ballast, in a manner similar to artificial turf. The turf marking strip may be further embedded and secured within the natural turf with a pair of elongate flexible turf anchoring strips laterally outward of the outer bands of ribbons and secured to the backing by sewing or with adhesives. The anchoring strips are of an open weave fabric to allow the roots of the natural turf to grow into and entangle with the anchoring strips. The natural grass lateral band adjacent the green synthetic ribbons gradually grows into and blends with the outer edges of the outer synthetic green ribbon bands. The light coloured middle band of synthetic ribbons remains clear of natural grass to visually mark playing field lines in a permanent manner which requires significantly less maintenance than conventional line marking systems.

I CLAIM:

1. A synthetic grass turf marking strip for visually marking lines in a natural grass turf surface when embedded within a shallow trench cut into the natural grass turf surface, the strip comprising:
 - an elongate flexible sheet backing, an underside of the backing comprising a trench bedding surface;
 - parallel rows of synthetic ribbons, extending upwardly from a top surface of the backing a pile height sufficient to extend a selected distance above said trench, the rows of ribbons including a middle band of ribbons of a first line colour and a pair of outer bands of ribbons of a second colour laterally adjacent the middle band.
2. A turf marking strip according to claim 1 further comprising:
 - a pair of elongate flexible turf anchoring strips laterally outward of the outer bands of ribbons and secured to the backing.
3. A turf marking strip according to claim 2 wherein the anchoring strips include bonding means for interconnecting with roots of the turf.
4. A turf marking strip according to claim 3 wherein the bonding means comprise a plurality of perforations in the anchoring strips.
5. A turf marking strip according to claim 4 wherein the anchoring strips comprise an open weave fabric.
6. A turf marking strip according to claim 1 further comprising:
 - ballast means on the backing for securing the marking strip within the trench.
7. A turf marking strip according to claim 6 wherein the ballast means comprise granular material disposed between the parallel rows of synthetic ribbons.
8. A turf marking strip according to claim 7 wherein the granular material

consists of particles selected from the group consisting of: sand; crumb rubber; gravel; granulated plastic; cork granules; styrene granules; epdm rubber granules; neoprene granules; and perlite granules.

- 5 9. A turf marking strip according to claim 8 wherein the granular material comprises a mixture of silica sand and ground crumb rubber.
- 10 10. A turf marking strip according to claim 8 wherein the particles range in size between four and seventy mesh.
- 11 11. A turf marking strip according to claim 1 wherein the backing comprises a fabric through which the ribbons are tufted.
- 15 12. A turf marking strip according to claim 11 wherein the backing comprises multiple plies of fabric layers.
- 13 13. A turf marking strip according to claim 12 including a needle punched fabric layer.
- 20 14. A turf marking strip according to claim 11 wherein the backing includes coating means on the backing underside for securing the ribbons to the backing.
- 25 15. A turf marking strip according to claim 11 wherein the backing includes coating means on the backing underside for impeding growth of natural turf grass through the backing.
- 30 16. A turf marking strip according to claim 1 wherein the ribbons consist of fibers selected from the group consisting of: polypropylene fibers; polyethylene fibers; and plastic fibers.
17. A turf marking strip according to claim 1 wherein the parallel rows of ribbons are spaced apart a distance in the range between $5/16$ to $2 \frac{1}{4}$ inches, and the parallel

rows of ribbons have a pile height in the range between 1 1/2 to 5 inches.

18. A turf marking strip according to claim 1 further including time release growth inhibitors on the backing.

5

19. A method of visually marking a line in a natural grass turf surface comprising the steps of:

cutting a shallow trench in the turf surface, the trench having a bottom and lateral sides;

10 laying a synthetic grass turf marking strip into the trench, the strip comprising: an elongate flexible sheet backing, an underside of the backing disposed on the trench bottom; parallel rows of synthetic ribbons, the ribbons extending upwardly from a top surface of the backing a pile height sufficient to extend a selected distance above said trench, the rows of ribbons including a middle band of ribbons of a first line colour
15 and a pair of outer bands of ribbons of a second colour laterally adjacent the middle band; and

depositing granular ballast material on the backing of the strip and disposed between the parallel rows of synthetic ribbons thereby securing the marking strip within the trench, wherein an upper portion of the ribbons extends beyond the ballast.

20

20. A method according to claim 19, wherein the turf marking strip includes:

a pair of elongate flexible turf anchoring strips laterally outward of the outer bands of ribbons and secured to the backing; and

25 wherein the method includes:

cutting slits in the lateral sides of the trench to form two lateral turf bands; lifting each lateral turf band above the slits to expose a bottom surface of the

slits;

laying the anchoring strips on the bottom surface of each slit; and

30

replacing the lateral turf bands upon the anchoring strips.

TITLE: LINE SYSTEM FOR PLAYING FIELD**TECHNICAL FIELD**

The invention is directed to a method of visually marking a line in a natural grass turf
5 surface by embedding a synthetic grass marking strip in a shallow trench.

BACKGROUND OF THE ART

Sport playing fields have conventionally been covered with natural grass or more
recently with synthetic grass surfaces to replace natural grass, since natural grass does
10 not stand up well to constant wear and requires a great deal of maintenance.

For games played on natural grass, there is a need to mark out the perimeters of the
play area and various boundaries of the game to be played. For example, football and
soccer playing surfaces have conventionally been marked with rope, paint, ribbons or
15 powdered chalk. The natural grass of course grows constantly and is subjected to rain
and wind. Replacing the lines of paint and chalk on natural grass fields is necessary
especially in respect of professional sport and involves high labour and material costs.
The placement of powdered chalk and paint is also dependent upon weather and wind
conditions which tends to increase the labour costs involved.

20

Paint and chalk often kill the surrounding grass and their use represents an undesirable
source of soil and air pollution resulting from repetitive application of paint to the
same area.

25 The alternative of providing a complete synthetic grass sport surface is usually only
practical where professional sports are involved due to the high cost of the synthetic
grass surface and accompanying maintenance. Natural grass surfaces do not grow
well in partially and fully enclosed sports stadiums. Synthetic grass surfaces stand up
much better to wear than natural grass surfaces, especially where traffic is heavy.

30

Providing a permanent line marking on synthetic grass surfaces is relatively simple.
The synthetic grass surface is constructed of a fabric backing with tufted synthetic

ribbons in a manner similar to the fabrication of a carpet. In order to mark permanent lines in a synthetic grass surface, white coloured ribbons are tufted in selected line patterns or the lines are painted or dyed after fabrication of the synthetic grass surface. In either case, there is a relatively straightforward means to produce permanent line markings in synthetic grass surfaces compared to natural grass surfaces.

The cost of installing large areas of synthetic grass surfaces prohibits the use of this solution for most commonly used outdoor play areas. Parks and schools or university athletic fields often carry more volume of play traffic than a professional sports arena would encounter, and suffer from excessive wear. In addition, the funds required to replace natural grass surfaces are often simply not available.

Natural grass surfaces with repeated paint or chalked lines often cake up and cause ridges that an athlete can trip on and may result in injury or inconsistent play.

The use of chalk lines or paint on natural grass surfaces is essentially a temporary installation since during play, the lines are scuffed by abrasion. The definition of such temporary lines is poor unless repeated maintenance is undertaken to improve the definition for various sports.

An object of the present invention is to provide a permanent marking system for natural grass turf surfaces in order to reduce the cost and labour involved in maintenance of the lines.

A further object of the invention is to provide superior definition of playing lines on a natural grass turf surface to address the blurring and smearing of chalk or paint lines.

A further object of the invention is to remove the physical obstacles to play and avoid tripping hazards which are present in conventional use of chalk or paint ridges.

A further object of the invention is to avoid the damaging of grass surfaces with paint and to avoid environmental pollution caused by repeated application of paint with

solvents and chalk which tends to effect the acidity of the soil adjacent.

DISCLOSURE OF THE INVENTION

- 5 The invention provides a novel method of visually marking a line in a natural grass turf playing surface by embedding a synthetic grass strip within the turf of football, or soccer fields for example.

The synthetic strip has a middle band of light coloured synthetic grass to mark the line
10 and outer bands of green coloured synthetic grass which blends in with the adjacent natural grass. Conventional line marking methods involve chalk or paint which damages the grass, needs frequent replacement and cause built up ridges which impose a risk during play.

- 15 Installation commences with cutting a shallow trench in the turf surface with a sod cutter for example. The synthetic grass turf marking strip is laid into the trench. The strip includes an elongate flexible sheet backing, an underside of which is placed on the trench bottom. Tufted through the backing are parallel rows of synthetic ribbons, extending upwardly from the top surface of the backing a pile height sufficient to
20 extend a selected distance above the trench. The rows of ribbons include a middle band of ribbons of a light colour to mark the line and a pair of outer bands of ribbons of a green colour laterally adjacent the middle band.

The strip is then buried in the trench under granular ballast material deposited on the
25 backing and between the parallel rows of synthetic ribbons with an upper portion of the ribbons extending beyond the ballast, in a manner similar to artificial turf.

The turf marking strip may be further embedded and secured within the natural turf with a pair of elongate flexible turf anchoring strips laterally outward of the outer
30 bands of ribbons and secured to the backing by sewing or with adhesives. The installation method is varied to include cutting slits in the lateral sides of the trench to form two lateral turf bands. Each lateral turf band is then lifted to expose a bottom

surface of the slits, and the anchoring strips are placed on the bottom surface of each slit. The lateral turf bands are then replaced upon the anchoring strips and secured in place with sod connectors such as long twisted screws or arrow head nails.

- 5 The anchoring strips are of an open weave fabric to allow the roots of the natural turf to grow into and entangle with the anchoring strips. The natural grass flap adjacent the green synthetic ribbons gradually grows into and blends with the outer edges of the outer synthetic green ribbon bands. The light coloured middle band of synthetic ribbons remains clear of natural grass to visually mark playing field lines in a
10 permanent manner which requires significantly less maintenance than conventional line marking systems.

Further details of the invention and its advantages will be apparent from the detailed description and drawings included below.

15

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be readily understood, a preferred embodiments of the invention will be described by way of example, with reference to the accompanying
20 drawings wherein:

Figure 1 is an exploded perspective view of a trench with lateral turf bands on either side lifted up in order to allow insertion of the synthetic grass turf marking strip with laterally attached anchoring strips on either side;

Figure 2 is a drawing of the shallow trench cut into an existing natural grass
25 turf surface with laterally extending slits cut into the soil adjacent the vertical edges of the trench to form the lateral turf bands;

Figure 3 is a sectional view through a completed installation showing the lateral turf bands replaced over the anchoring strips and the synthetic grass turf marking strip positioned on the bottom of the trench with a middle band of ribbons of
30 a light colour to mark the line and outer bands of a green colour to blend naturally with the laterally adjacent natural grass; and

Figure 4 is a detailed view similar to Figure 3 specifically showing the

granular material deposited between the parallel rows of synthetic ribbons to secure the marking strip within the trench and showing the natural grass with roots extending downwardly to interconnect with the open weave anchoring strip material.

5

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Figure 2, the invention provides a method of visually marking a line in a natural grass turf surface (1), which is initiated by cutting a shallow trench (2), into the turf surface (1). The trench (2) has a bottom (3) and two vertical lateral sides (4). The synthetic grass turf marking strip may include laterally extending anchoring strips which provides improved anchorage within the natural grass turf surface (1). To accommodate the anchoring strips, the method preferably includes cutting slits (5) in the lateral sides (4) of the trench (2) to form two lateral turf bands seen in Figure 1 and identified with numeral six (6). The trench (2) is cut using a sod cutter and lifting of each lateral turf band (6) above the slits (5) may be accomplished by manual lifting or with a plow like device to expose a bottom surface of the slits (5).

Figure 3 shows a completed installation whereas Figure 1 illustrates the intermediate installation of the synthetic grass turf marking strip (7). The strip (7) includes an elongate flexible sheet backing (8) an underside of which is laid into the trench on the trench bottom (3). The synthetic marking strip (7) includes several parallel rows of synthetic ribbons (9). The ribbons (9) extend upwardly from the top surface of the backing (8) to a pile height (indicated as dimension L in Figure 4) sufficient to extend a selected distance indicated as dimension D in Figure 4 (above the trench (2) in completed installation).

As indicated in Figure (1) the rows of ribbons (9) include a middle band (10) of ribbons of a first line colour such as white or yellow to mark the line in the playing field. The rows of ribbon include a pair of outer bands (11) of a green colour or other colour to blend naturally with the colour of the natural grass turf (1).

Following the progression from Figure (1) to Figure (3), it can be seen that the

underside of the backing (8) is easily placed on the trench bottom (3) and the laterally extending anchoring strips (12) laid on the bottom surface of each slit (5). The lateral turf bands (6) are replaced upon the anchoring strips (12) to partially secure the synthetic grass marking strip (7) into the trench (2).

5

As shown in Figure 1, the elongate anchoring strips (12) are of a flexible open weave material preferably, which is secured to the backing (8) by sewing as shown or with adhesives.

- 10 As indicated in Figures 3 and 4, the next step of the installation procedure is depositing granular ballast material (13) on top of the backing (8) of the strip (7) and disposed between the parallel rows of synthetic ribbons (10) and (11) to a depth T. The ballast material (13) is preferably a mixture of silica sand and cryogenically ground crumb rubber which secures the marking strip (7) within the trench (2) under
15 the weight of the ballast (13).

As indicated in Figures 3 and 4, the upper portion of the ribbons (10) and (11) extends beyond the ballast (13) a distance D. The light coloured ribbons (10) permanently mark the playing field line whereas the dark coloured ribbons (11) usually coloured
20 green will merge and blend with the laterally adjacent natural grass surface (1).

Referring to Figure 4, the anchor strips (12) can include any type of bonding means for interconnecting with roots (14) of the turf (1). For example, a fuzzy type fiber or multiple strands would entangle with the growing roots (14) to bind the anchoring
25 strips (12) in the ground surface. Preferably the anchoring strips (12) include perforations to allow passage of the grass roots (14) through the anchoring strips (12) to improve the bond with the adjacent grass turf (1). A synthetic fiber open weave fabric is shown as the preferred anchoring strip (12) in the illustrations. Such fabrics are readily available and can be sewn to the backing (8) or secured with adhesives.

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As shown in Figure 3 and best seen in Figure 4, the granular ballast (13) provides means to secure the backing (8) within the trench (2) under the weight of the ballast

(13). The ballast (13) is preferably of granular material to integrate into the surrounding soil and natural grass turf (1) and to fill the spaces between parallel rows of synthetic ribbons (10) and (11). Through experience it has been found that the preferred ballast (13) is a mixture of silica sand and ground crumb rubber. The
5 preferred particle size range is between 4 and 70 mesh and depends on the matching of the adjacent natural turf and soil (1).

The trench (2) may be of a width between 2 and 24 inches depending on the width of the line and degree to which the natural turf (1) is required to blend in with the
10 synthetic outer bands (11). If there is a noticeable difference between the characteristics of the natural turf (1) and the area filled with ballast (13), this may detrimentally effect the play of games on the surface or present a soft or hard ridge area with undesirable consequences. Where sand only is used in conjunction with synthetic grass sporting surfaces, the surfaces usually become hard after extended use
15 because the sand between the rows of ribbons (10) and (11) becomes highly compacted. This tendency to become compacted can be offset by widening the space between parallel rows of adjacent ribbons (10) and (11). In general, resilient pads are used on the underside of synthetic grass sporting surfaces to provide some resilience, however, they usually slowly collapse under use becoming denser and less resilient.
20 Removal, replacement or loosening of compacted particulate ballast (13) is difficult if the spacing between rows and ribbons (10) and (11) is close.

It has been found through experiment that the preferred spacing between adjacent rows of ribbons (10) and (11) is in the range between $5/16$ and $2\frac{1}{4}$ inches. A closer
25 spacing impedes the installation of the ballast (13) and may lead to compaction. It has also been found that the pile height of the parallel rows of ribbons, indicated in Figure 4 as dimension L is preferably in the range of $1\frac{1}{2}$ inches to five inches. A shorter pile height would tend to expose the backing (8) to wear and a longer pile height increases the cost and depth of ballast (13) and in most applications, is unnecessary to improve
30 the performance of the surface. In general, a shallow depth of cut is preferred since the disturbed soil and filled granular materials (13) settle after installation. A deeper cut depth leads to greater settlement.

Many prior art synthetic grass surfaces have been known to have relatively poor playing qualities and have fallen into disfavour with professional athletes due to the increased risk of injury and detrimental effects of game play. In applying such synthetic surfaces to the present invention, it can be seen that the designer must attempt to provide a relatively uniform playing characteristic between the transition from natural grass turf (1) to synthetic turf marking strip (7). Continuity between the characteristics of the adjacent playing surfaces is accomplished by careful choice of ballast (13) composition. Rounded sand particles had been thought to be preferable since they compact less and cause less abrasion, however, the surfaces can become very slippery. The use of longer ribbons (10) and (11) allows a thicker layer of ballast (13) to be used. Where the ballast includes resilient granules of ground rubber, the need for a resilient under padding is eliminated and the installation of the strip (7) is simpler and cheaper. A relatively thick layer of ballast (13) promotes better drainage. It has been found that the preferred depth of ballast (13) is within the range of 1/4 to 3/4 of the pile height of the adjacent ribbons (10) and (11). The longer ribbons provide a more realistic grass like surface in combination with the wide spacing between ribbon rows. This combination allows the players cleats to penetrate the surface for traction, but also allow easy release. Excessive penetration of cleats into the backing (8) would risk injury and damage to the turf marking strip (7). The ballast (13) is a mixture of silica sand which is readily available and ground rubber particles. Cryogenically ground rubber particles wet more easily than non-cryogenically ground rubber particles and therefore promote improved drainage. The designer must balance the ratio of sand to rubber depending on the desired resilience relative to the adjacent natural turf surface (1).

The ballast (13) is preferably a mixture of commonly available silica sand and cryogenically ground rubber particles. The designer chooses a ratio of hard sand particles to resilient rubber to match as closely as possible the characteristics of the adjacent natural turf surface (1). The harder the surface, the more sand is used in the ratio. Cryogenically ground rubber is less angular than non-cryogenically ground rubber and therefore, has less tendency to allow water and microscopic air bubbles

carried by water to attach to it. Therefore, there is less tendency for the rubber particles to float upwardly when the surface is flooded. Separation of the particles results in loss of material and could change the playing qualities of the surface. Silica sand can be replaced if desired by graded gravel, hard and heavy granulated plastics with sizes between 4 and 70 mesh, preferably between 15 and 30 mesh for sports where abrasion of players contacting the surface is a factor and between 4 and 30 mesh where abrasion is not a factor. The cryogenically ground crumb rubber could be replaced by other resilient type materials, such as cork, styrene, epdm rubber granules, neoprene or other similar materials. Use of perlite granules can enhance moisture absorption and reduce compaction as well. Use of sand will reduce the cost of the ballast (13). The ballast (13) is placed between the adjacent ribbons (10) and (11). Access to the strip (7) for maintenance or replacement can be had by inserting a compressed air wand into the ballast (13) to blow the ballast (13) out of the area. The backing (8) is a coarse fabric material through which the ribbons (10) and (11) are tufted. Porosity in the backing (8) promotes drainage through the backing which is essential for the proper maintenance of relatively flat playing surfaces. As indicated in Figure 4 the backing (8) preferably comprises multiple plies of fabric layer. One of the plies may be a needle punched fabric layer to promote the moisture wicking properties of the backing (8) and enhance passage of water through the backing (8). Materials appropriate for backing use include woven or needle punched synthetic fabrics of nylon or polypropylene for example. Needle punching with synthetic fuzzy fibers enhances the wicking properties of the combined material.

The ribbons (10) and (11) consists of fibers such as polypropylene fibers, polyethylene fibers or other plastic fibers common to the synthetic grass surface manufacturing procedures. Ribbons are made from a strip having a width ranging between $\frac{1}{4}$ inch and 1 inch but preferably $\frac{1}{2}$ inch wide. The thickness of the strips range between 65 microns and 150 microns. The ribbons (10) and (11) are cut from the strip and fastened by tufted to the backing (8) in parallel rows. Between two and eight tufts are formed per inch of row with four tufts per inch being preferred. The strips are mechanically fibrillated or split to a width of approximately $\frac{1}{8}$ of an inch or more.

As indicated in Figure 4, the underside connection of ribbons (10) (11) to backing (8) may be enhanced by applying an adhesive coating (15). Such a coating serves to better anchor the fibers of the ribbons (10)(11) to the backing material. Spaces
5 between the coating ridges (15) leave strip areas in the backing (8) to allow for drainage through the backing. Alternatively, the coating can be spread across the entire underside surface of the backing (8) to better prevent the growth of grass through the underside of the backing (8). Grass may have a tendency to grow over time underneath the backing and infiltrate between the spaces in the ballast (13) in the
10 green fiber areas of ribbons (11). Application of a coating on the underside of the backing prevents such growth through the backing (8). The coating may be applied only in the underside area of the light coloured ribbons (10) if drainage is detrimentally affected by full underside coating. Alternatively, time release growth inhibitor compounds may be placed on the backing (8) either directly applied to the
15 backing (8) or included in the granular ballast (13) to retard natural grass growth in the area of the strip.

Although the above description and accompanying drawings relate to specific preferred embodiments as presently contemplated by the inventor, it will be
20 understood that the invention in its broad aspect includes mechanical and functional equivalents of the elements described and illustrated.

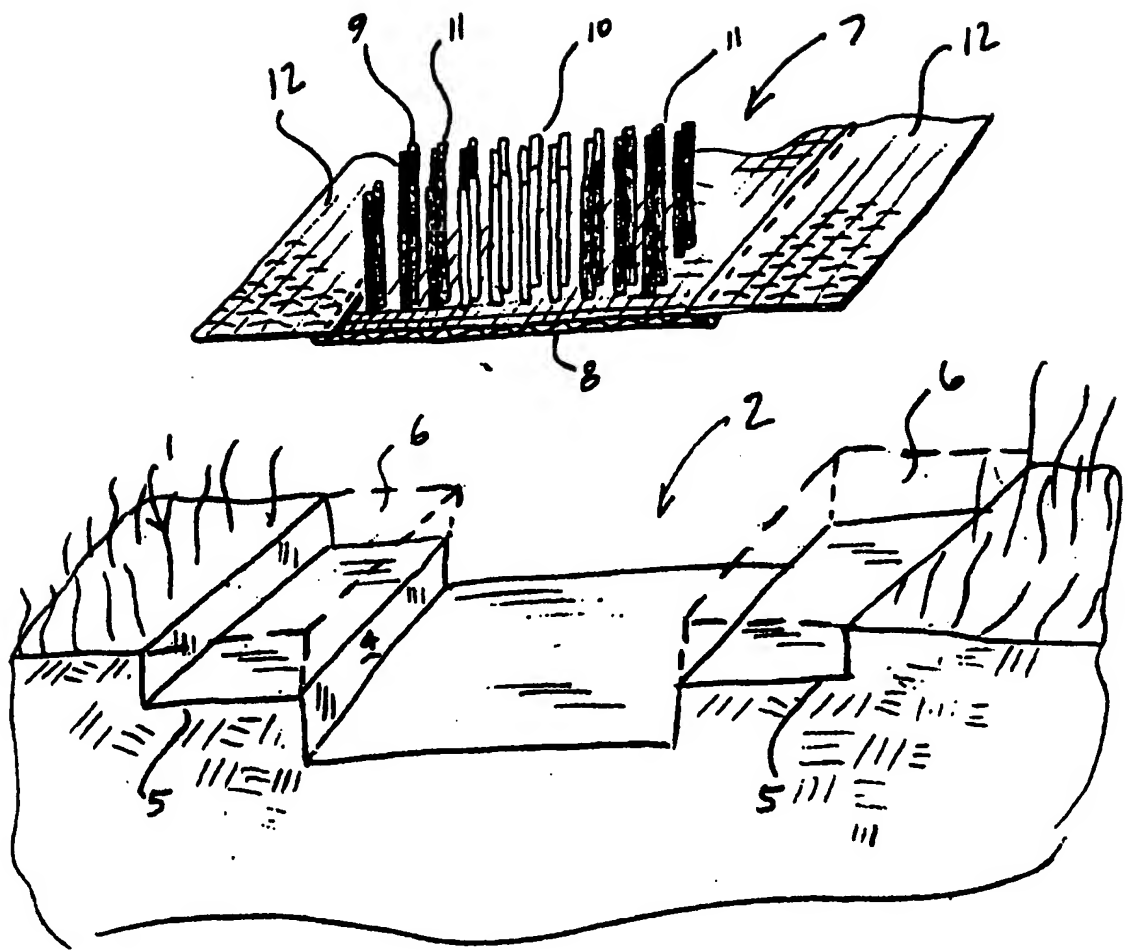


Fig. 1

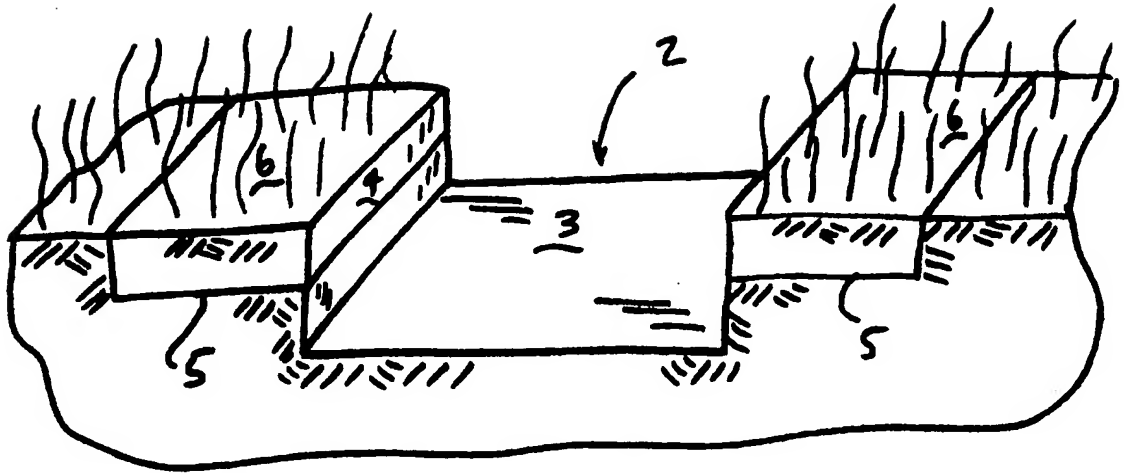


Fig. 2

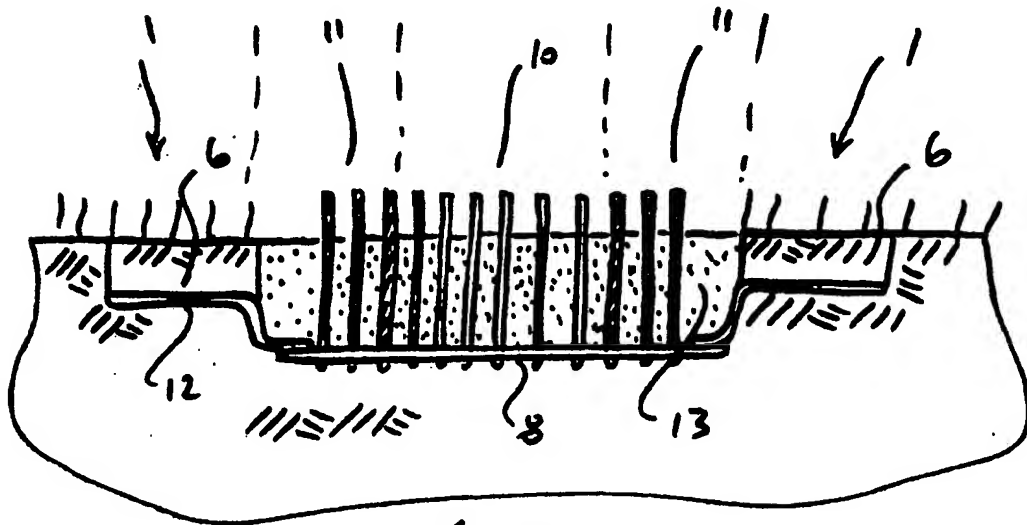


Fig. 3

